that such treatment leads to an increase in ammonium salts, but it is not shown that such an increase of ammonium salts, by furnishing more nitrogen, will cause such a rise in yield, nor that the beneficial effects are not due to any one of half a dozen other possible changes in the soil. BOLLEY has some evidence that in the wheat lands of North Dakota such treatment increases yield by killing certain parasitic fungi.

Since SCHREINER and his collaborators have shown that many organic substances, some toxic and some stimulative to higher plants, are produced by decomposition of the organic débris of the soil, it is possible that the effect here is due to accumulated organic substances of one sort or another brought about by unbalancing the soil flora or fauna. Our Bureau of Soils has also collected much other data showing the extreme complexity of the problem of fertility and the danger of reasoning too directly from the mineral nutrient theory.

There are a number of minor defects involving form of statement, degree of emphasis, and errors of fact (certain to creep into the most carefully written book) that deserve notice. Only a few of these can be mentioned. Considering the idea RUSSELL wishes to convey, it seems better to use the more specific term "mineral nutrient" than the word "food." The author considers that non-available water is such because of the concentration (osmotic activity) of the salts in it (p. 104). Known facts in this matter indicate clearly that the resistance to absorption is capillary. Rendering soil toxins innocuous by oxygenating or by filtering over fine powders is described as precipitating them (p. 133), whereas the process in the first case is oxidation and in the second adsorption. No mention is made of the importance of surface tension in soil phenomena, though it plays an important rôle in flocculation, deflocculation, localization of solutes, etc.—WILLIAM CROCKER.

The evolution of plants

This little volume by SCOTT[2] belongs to a not unfamiliar category, but it is rare to find a work on evolution written by an eminent morphologist and a distinguished paleobotanist. This constitutes such an unusual equipment that although the work under consideration is popular in its appeal, the mode of treatment is of interest to the professional botanist.

The author at the outset draws a happy parallel between the value of our knowledge of fossil forms as a key to the course of plant evolution in general and the history of cultivated varieties of plants in relation to their derivation from wild ancestors. In a second chapter the characteristics and statistics of the angiosperms are dealt with, special emphasis being laid on the external organization of the angiospermous flower. In the third chapter the gymno-

[2] SCOTT, D. H., The evolution of plants. pp. 256. *figs. 25*. New York: Henry Holt & Co. 1912. 75 cents.

sperms are discussed, which as the author points out constituted the characteristic vegetation of the secondary or Mesozoic period, just as the angiosperms are of the present. Here, in accordance with the author's well known point of view, the Cycadophytes receive a very large amount of attention, to the practical exclusion of the actually as well as mesozoically much more important Coniferales.

Beginning with the living cycads, which are remarkably well summarized as to their characteristics and distribution, SCOTT continues with a description of the more important features of the mesozoic Cycadophytes, the Bennettitales. These are elaborated chiefly in connection with the hypothesis revived in recent years by WIELAND, that they are the direct ancestors of the angiosperms. Here the distinguished author, so well known for his anatomical investigations, pins his faith unreservedly to the externals of their reproductive structures. His summary of their angiospermous features is as follows: (1) the presence of flowers organized on the same general plan as the typical flowers of the angiosperms; (2) the formation of a fruit inclosing the seed; (3) the exalbuminous character of the seed. SCOTT concludes in regard to the Bennettitales and their supposed angiospermous affinities: "They have thus proved to fully deserve the name Proangiosperms, which SAPORTA, by a brilliant inspiration, gave to *Williamsonia* and *Bennettites*, at a time when their stucture was very imperfectly known." It is perhaps worth while to recall in this connection that ASA GRAY, who knew his Compositae perhaps better than any other person living, referred the genus *Williamsonia* with conviction to the Compositae. Apparently the reproductive structures of the Bennettitales may be quite as appropriately regarded as equivalent to the inflorescence of this high group of dicotyledons as that of the flower of the lower angiosperms. Surely here Homer nods!

One of the most interesting chapters is that in which the author deals with the fernlike seed plants, which he himself has done so much to rescue from oblivion and restore. With characteristic modesty he makes no reference to his own contributions in this interesting field. The Medulloseae are apparently now regarded as more nearly allied to the cycad stock than the Lyginodendreae, thus slowly reversing the opposite conclusion adopted by the author in earlier years.

The book concludes with chapters on the true ferns, the club mosses, and horsetails (together with sphenophylls), which latter SCOTT still prefers to associate with the fern stock. The closing remarks on the relation of the paleobotanical record to the general principles of plant evolution are of particular value, most of all the statement as to evolutionary progress being more frequently from the more to the less complex and not vice versa, as is too often assumed by writers on evolution. Would that SCOTT and other English morphologists might focus their attention on this principle in dealing with anatomical structures!—E. C. JEFFREY.